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**RENEWABLE
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Introduction

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Energy and architecture form a natural marriage if indoor comfort and respect for environment are secured. The role of energy within buildings varies from country to country, climate to climate; from 30% in OECD countries, 50% in non-OECD Europe to 70% in developing countries. Population growth and demand for housing have forced politicians to embark on massive housing schemes without consideration of comfort, energy demand and environmental issues. In this book we are seeking to understand how previous generations lived in harsh climates and without abundant sources of energy, yet managed to design and build appropriate dwellings providing both comfort and harmony with the environment. We have only to look at the Vernacular architecture which existed in the areas of extreme climate such as India, Africa and Scandinavia where indigenous materials were utilised to construct attractive and comfortable homes.

Modern technology has provided us with excellent new materials such as “switchable” material; light but strong structural materials and a variety of insulations. It is now commonly accepted by architects and builders that due consideration must be given to energy conservation; the use of natural lighting and use of solar energy for both heating and cooling; as well as enhanced natural ventilation and minimal impact on the environment.

In this book we seek to approach the architecture-energy combination and its relationship to the environment. There are chapters on thermal comfort, low energy architecture dealing with various criterion for comfort in different parts of the World. For example in the State of Qatar 50% of the energy used in that country can be saved by using low energy buildings with several measures such as shading, evaporative cooling, the use of appropriate thermal mass and natural ventilation coupled with radiative cooling. Contemporary architecture, in some cases, ignores most of these elements and concentrates on using excessive energy to cool or heat buildings. In the Gulf Region, 70% of the electricity generated is used for cooling the buildings.

Other chapters state the principles of thermal comfort, how the thermal exchange takes place between man and the various parts of the building elements. Some authors developed their own models to evaluate such exchange. The bioclimatic concept in Vernacular Architecture was addressed thoroughly in one chapter starting a good comparison between Vernacular and contemporary architecture, then addressing the impact of climate on the building forms. The climate which plays a major role at

different locations and how this dictates the shape and form of the buildings and save some energy. The igloo of the Inuit and the open courtyard houses of the Mediterranean are good examples of typologies depending on the climate.

Another chapter is devoted to the importance of micro-climate and its various elements and usage to obtain comfort such as the air movement, the Sun effect, the thermal mass, the vegetation, shading devices and the use of water and moisture in improving living conditions in a dry climate.

One of the most important energy saving elements in buildings is the use of daylighting to conserve and reduce heat gain into buildings. It explains the various conditions of the sky, the basic physical principle of lighting, the physiology of vision, and goes to the use of daylighting in architecture to improve the building design and accesses this use effectively.

Ventilation and its importance in buildings was presented in another chapter where the indoor pollutants, ventilation strategies, the air flow principles, air leakage in buildings, natural and solar induced ventilation and mechanical ventilation were explained and their usage was demonstrated.

The last chapter outlines in depth the technology for modern architecture. The elements and concepts such as ventilated roofs, active curtain walls, the use of greenhouses, movable shading devices, light ducts, integrated ventilation, cooling elements and the use of outdoor spaces are all researched and their uses have been illustrated in this chapter.

We hope the book will be of use to architectural students; building technologists; energy experts and urban and town planners. It will be equally interesting to all those who are concerned about the environment and advocate the use of appropriate technologies to reduce energy consumption.